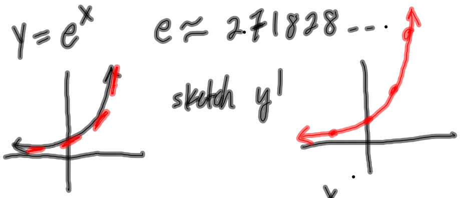
3.9 derivatives of exponential functions

$y=e^x$ $\quad e \approx 2.71828\ldots$

sketch y'



$y'=e^x$

$$\boxed{\frac{d}{dx} e^u = \frac{du}{dx} e^u}$$

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$$\frac{d}{dx} e^{(\sin x)} = \cos x \cdot e^{\sin x}$$

$$\frac{d}{dx} e^{(x^2+x)} = (2x+1)\, e^{x^2+x}$$

$$\frac{d}{dx} e^x \tan^{-1} x = e^x \frac{1}{1+x^2} + \tan^{-1} x \cdot e^x$$

$$\frac{d}{dx} e^{\sqrt{x}} = \frac{1}{2} x^{-\frac{1}{2}} \cdot e^{\sqrt{x}} = \frac{e^{\sqrt{x}}}{2\sqrt{x}}$$

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$$\frac{d}{dx} 2^x = 2^x \ln 2$$

$$\frac{d}{dy} 3^x = 3^x \ln 3$$

$$\frac{d}{dx} 10^x = 10^x \ln 10$$

$$\frac{d}{dx} a^x = a^x \ln a$$

$$\ln 8 = \ln 2^3$$

$$\frac{d}{dy} 8^x = 8^x \ln 8$$

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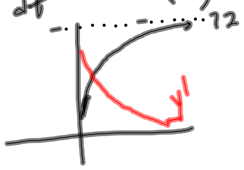
$$\boxed{\frac{d}{dx} a^u = \frac{du}{dx} \cdot a^u \ln a}$$

$$\frac{d}{dt}\, 72 - 30(.98)^t = -30(.98)^t \ln(.98)$$



when is the milk warming the fastest?
at $t=0$

Oct 12-1:53 PM

$$\frac{d}{dx} \frac{2^{\sqrt{x+1}}}{\sec^{-1} x} =$$

$$\frac{(\sec^{-1}x)\left(\frac{1}{2}(x+1)^{-\frac{1}{2}}\, 2^{\sqrt{x+1}} \cdot \ln 2\right) - 2^{\sqrt{x+1}} \frac{1}{|x|\sqrt{x^2-1}}}{(\sec^{-1}x)^2}$$

Oct 12-2:00 PM